



Economic Resilience Inquiry
New Zealand Productivity Commission
PO Box 8036
Wellington 6143
[By email: info@productivity.govt.nz]

17 April 2023

Re: AWS comments on the Improving Economic Resilience Issues Paper

Dear Madam/Sir,

Amazon Web Services New Zealand Ltd. (AWS) is grateful for the opportunity to comment on the Productivity Commission's Issues Paper on Improving Economic Resilience. We welcome the timeliness and the broad scope of the present inquiry as well as the economic resilience definition adopted by the Commission, which focuses both on preparation and recovery from disruptions across industries. AWS New Zealand Ltd. would be pleased to engage with the Commission in more detail on the issues touched upon in this initial submission and in particular regarding the resilience proposition of cloud technology and AWS infrastructure under development in New Zealand.

Introduction

As you may be aware, AWS is the cloud computing arm of Amazon.com, Inc. AWS has been operating in New Zealand for 10 years. We have offices in Auckland and Wellington and employ more than 150 New Zealand staff in roles such as solutions architects, account managers, sales representatives and professional services consultants. We plan to hire a further 200 staff in the next few years to support local digital transformation. In September 2021, AWS announced that it would establish an AWS Region in Auckland in 2024, which will bring world-class cloud computing infrastructure onshore to New Zealand. This will enable our thousands of active customers in New Zealand – from large enterprises to government to small businesses and individuals already using AWS global infrastructure – to leverage our advanced cloud services to innovate and scale using highly secure and resilient infrastructure located in New Zealand. The Economic Impact Study¹ that accompanied the AWS infrastructure announcement estimated that this investment of NZ\$7.5 billion will create around 1,000 new jobs and contribute approximately NZ\$10.8 billion to New Zealand's GDP over next 15 years.

We welcome inclusion of the digital technology sector in the eight selected industry areas, and underscore its importance to the wider economy. In this submission, we note the resilience proposition of AWS global infrastructure and the planned AWS Region in New Zealand, and how cloud technology is being used to improve the resilience of supply chains. We recommend two themes for consideration by the Productivity Commission: 1) the importance of industry-government cooperation to deliver on economic resilience outcomes across key sectors; and 2) the importance of skilled people as vital to the resilience of value chains across the identified economic sectors, and particularly the need for digital technology skills across all sectors.

¹ [AWS, Economic Impact Study, New Zealand Region \(2021\)](#)



The importance of New Zealand’s digital sector to economic resiliency

As noted above, we welcome the inclusion of the digital technology sector as one of the eight selected industry groups for the inquiry. New Zealand’s digital technology sector is growing rapidly and it supports productivity, and indeed resiliency, across other industries both directly and indirectly.

A diverse New Zealand economy with a growing digital sector and more digitally enabled traditional companies can further increase overall economic resilience. The New Zealand digital technology sector is innovative, flourishing and competitive. New Zealand has the benefits of robust competition in the digital products and services, and data storage and processing industries from local companies and local branches of multinational corporations. Digital companies have shown counter-cyclical growth when more traditional industries struggle. During the COVID-19 pandemic, for example, the digital sector demonstrated strong sustained growth when global commodity trends and supply chain vulnerabilities severely impacted traditional segments of the economy.

New Zealand’s Digital Technologies Industry Transformation Plan (Digital ITP) identified software as a service (SaaS) as a key growth engine for the sector. We see cloud technologies such as AWS as an important enabler for SaaS companies. Research shows that more than half of the world’s 25 largest SaaS companies are using AWS and, in the United Kingdom, 39 of the country’s 50 fastest-growing technology companies use AWS. Many of the significant New Zealand and global success stories identified in Digital ITP have been enabled in part through their use of cloud technologies such as AWS. AWS is proud to have many of the highly successful companies specifically mentioned in the Digital ITP as AWS customers, including for example Orion Health, Wētā FX, Xero and Sharesies. The Digital ITP also recognised a number of successful international companies (e.g. Canva, Atlassian, Salesforce and Netflix), which also use AWS cloud technology to drive their success.

New Zealand has seen rapid growth in its technology exports sector. According to the 2022 TIN200 Report, in the year to March 2022 the top 200 technology exporting companies generated NZ\$15.1B in revenue (up 9% on the preceding year) and comprised 14% of New Zealand’s total export revenue for the year to June 2022 (2nd to the dairy industry).² Export-oriented digital technologies can benefit significantly from the use of advanced cloud technologies to develop and scale their services. An export-oriented digital industry that is built on leading cloud technologies can benefit from the security, resilience, cost effectiveness, agility, pace of innovation, and the ability to go global in minutes. Cloud technology customers can also leverage services such as machine learning and artificial intelligence available from cloud service providers, as well as go to market solutions such as [AWS Marketplace](#). The New Zealand technology sector also demonstrates interesting revenue diversification in its exports. The TIN 200 Report noted the top 200 digital exporting companies saw a broad geographic spread with 26.8% of their export revenue from Australia, 23.1% from North America, 12.8% from Europe, 7% from Asia, 1.5% from Latin America and 4.9% from the rest of the world (with the balance generated domestically).³

The Productivity Commission’s *Frontier Firms* inquiry used New Zealand software companies as an example of an industry that is able to overcome some of the key barriers to export growth and productivity: “The software industry provides an example of how “weightless” industries can overcome the hurdles of exporting from a small, distant economy. Software firms are well connected internationally and have high rates of exporting (Lewis et al., 2021). Once a software product is created, it can usually be replicated with minimal marginal cost, creating large scale economies. The industry is notable for taking a collaborative approach where firms can piggyback on each other’s technology. Digital platforms have also reduced or eliminated the use of intermediaries between

² <https://tin100.com/2022-tin-report-pr/>

³ *ibid.*



producers and consumers in the publishing process, making the distribution of unique products much easier”.⁴

Digital technologies such as cloud have a positive impact well beyond the digital sector - they help businesses to attract new customers, expand services, enter new markets, connect into smart supply chains, automate processes, and automate compliance activities. Digital technologies are having a positive transformative impact across many industries from the agriculture to advanced manufacturing to services industries. Cloud technology is being used to drive innovation, create new products and services, address security challenges, improve quality and reduce downtime, support worker safety, manage energy management, enhance security, and drive cost optimisation across operations. 2020 research by NZIER on cloud technology in New Zealand suggests that a 20 percent increase in the uptake of cloud computing in New Zealand would lead to annual real GDP growth of NZ\$3.5 billion to \$6.2 billion.⁵ Research abroad has shown the very significant contribution of cloud technology adoption to improvements in productivity and growth for companies. A 2020 study⁶ in the United Kingdom (UK) conservatively estimated that the use of AWS cloud services is generating £8.7 billion in economic value for businesses across the UK - the equivalent of 0.4% of GDP. That is more value than some entire industries in the UK - for example, the Premier League, the UK music industry, or half of the pharmaceutical sector. This impact is distributed across businesses large and small, and from every sector.

How AWS infrastructure supports digital resiliency

In September 2021, AWS announced the AWS Asia Pacific (Auckland) Region to be open in 2024, with three Availability Zones to give customers in New Zealand the ability to run workloads and store data in-country. An Availability Zone (AZ) is one or more discrete data centres with redundant power, networking, and connectivity in an AWS Region. AZs give customers the ability to operate production applications and databases that are more highly available, fault tolerant, and scalable than would be possible from a single data centre. All AZs in an AWS Region are interconnected with high-bandwidth, low-latency networking, over fully redundant, dedicated metro fibre providing high-throughput, low-latency networking between AZs. All traffic between AZs is encrypted. The network performance is sufficient to accomplish synchronous replication between AZs. AZs make partitioning applications for high availability easy. If an application is partitioned across AZs, companies are better isolated and protected from issues such as power outages, lightning strikes, tornadoes, earthquakes, and more. AZs are physically separated by a meaningful distance, many kilometres, from any other AZ, although all are within 100 km (60 miles) of each other.

Customers deploying their workloads across multiple AZs in an AWS Region is part of a high availability strategy designed to protect workloads by isolating issues to one AZ, and uses the redundancy of the other AZs to continue serving requests. The [AWS White Paper on AWS Fault Isolation Boundaries](#) describes in significant detail how AWS infrastructure uses multiple fault isolation constructs to help customers achieve their resilience objectives. These fault isolation boundaries enable customers to design their workloads to take advantage of the predictable scope of impact containment they provide. A Multi-AZ architecture is also part of a disaster recovery (DR) strategy designed to make workloads better isolated and protected. DR strategies may also make use of multiple AWS Regions.

Prior to building data centres, we consider potential threats and designing, implementing, and testing controls to ensure the systems, technology, and people we deploy counteract risk. Below are some key characteristics of our control environment for AWS data centres:

⁴ <https://www.productivity.govt.nz/assets/Documents/Final-report-Frontier-firms.pdf>, see p.78.

⁵ <https://www.nzier.org.nz/publications/economic-potential-of-cloud-based-business-tools>

⁶ <https://awsimpactreport.publicfirst.co.uk/>



- *Site selection:* Prior to choosing a location, AWS performs initial environmental and geographic assessments. Data centre locations are carefully selected to mitigate environmental risks, such as flooding, extreme weather, and seismic activity. Our AZs are built to be independent and physically separated from one another.
- *Redundancy:* Data centres are designed to anticipate and tolerate failure while maintaining service levels. In case of failure, automated processes move traffic away from the affected area. Core applications are deployed to an N+1 standard, so that in the event of a data centre failure, there is sufficient capacity to enable traffic to be load-balanced to the remaining sites.
- *Availability:* AWS has identified critical system components required to maintain the availability of our system and recover service in the event of outage. Critical system components are backed up across multiple, isolated AZs. Highly resilient systems, and therefore service availability, is a function of the system design. Through the use of AZs and data replication, AWS customers can achieve extremely short recovery time and recovery point objectives, as well as the highest levels of service availability.
- *Capacity planning:* AWS continuously monitors service usage to deploy infrastructure to support our availability commitments and requirements. AWS maintains a capacity planning model that assesses our infrastructure usage and demands at least monthly. This model supports planning of future demands and includes considerations such as information processing, telecommunications, and audit log storage.
- *Business continuity plans:* The AWS Business Continuity Plan outlines measures to avoid and lessen environmental disruptions. It includes operational details about steps to take before, during, and after an event. The Business Continuity Plan is supported by testing that includes simulations of different scenarios. During and after testing, AWS documents people and process performance, corrective actions, and lessons learned with the aim of continuous improvement.
- *Asset management:* AWS assets are centrally managed through an inventory management system that stores and tracks owner, location, status, maintenance, and descriptive information for AWS-owned assets. Following procurement, assets are scanned and tracked, and assets undergoing maintenance are checked and monitored for ownership, status, and resolution.
- *Power:* Our data centre electrical power systems are designed to be fully redundant and maintainable without impact to operations, 24 hours a day. AWS ensures data centres are equipped with back-up power supply to ensure power is available to maintain operations in the event of an electrical failure for critical and essential loads in the facility.
- *Ongoing data centre risk management:* The AWS Security Operations Center performs regular threat and vulnerability reviews of data centres. Ongoing assessment and mitigation of potential vulnerabilities is performed through data centre risk assessment activities. This assessment is performed in addition to the enterprise-level risk assessment process used to identify and manage risks presented to the business as a whole. This process also takes regional regulatory and environmental risks into consideration.

Cloud technologies support operational resilience and supply chains across industries

New Zealand companies of all sizes can use cloud technology to transform and strengthen their operations through access to a wide range of advanced cloud solutions such as data analytics, artificial intelligence (AI) and machine learning (ML) and internet of things (IoT), while taking advantage of the highest levels of security, resilience and availability of public cloud. Customers from regulated industries with in-country data preferences will be among the primary beneficiaries of an AWS Region in Aotearoa. There are significant opportunities for further public cloud transformation for customers



in sectors like financial services, telecommunications, and utilities. Additionally, customers with low latency requirements, such as those in the media and entertainment industry, are also important beneficiaries. Local cloud infrastructure will positively impact New Zealand’s small-medium businesses segments by helping customers to overcome latency obstacles.

New technologies such as spatial computing, simulation and digital twins are cloud powered technologies that have been maturing for years, that are now becoming more accessible, in turn enabling a new class of use cases that will be unbound by physical constraints. Simulation technologies like AWS SimSpace Weaver will pave the way for a future where nearly anything in our world can be simulated. With simulation, we can peer into the future to see the impacts of our efforts, running numerous “what-if” scenarios that answer our questions without having to wait and see what the impact might be many years down the line. Simulations will help us make better decisions about the roadways and housing we construct, the ways we organise our warehouses, and the ways we respond to disasters.

As Amazon Chief Technology Officer Werner Vogels has stated “The supply chain of the future is digital”. The key to transforming supply chains and make them more resilient is to use technology to optimise each step along a product’s journey. We will see an acceleration in the development of smart factories, smart equipment, and smart shipping that does just that. Each will play a role in improving worker safety, optimizing inventory management, reducing maintenance costs, and streamlining production processes. In recent years, supply chains have experienced unprecedented supply and demand volatility accelerated by widespread resource shortages, geopolitics, and natural events. These disruptions put pressure on businesses to plan for potential supply chain uncertainty, respond quickly to changes in customer demand, and keep costs low. When businesses inadequately forecast for supply chain risks—such as component shortages, shipping port congestion, unanticipated demand spikes, or weather disruptions—they face excess inventory costs, or stockouts that cause poor customer experiences.

[AWS Supply Chain](#) is an example of a cloud based application that improves supply chain visibility and provides actionable insights to help businesses optimise supply chain processes and improve service levels. Customers can easily set up a unified supply chain data lake using AWS Supply Chain’s built-in connectors, which use pre-trained machine learning models based on Amazon.com’s 30 years of supply chain experience, to understand, extract, and aggregate data from Enterprise Resource Planning and supply chain management systems. AWS Supply Chain then contextualises that information in a real-time visual map highlighting current inventory selection and quantity at each location. Inventory managers, demand planners, and supply chain leaders can view machine learning-generated insights for potential inventory shortages or delays, and create watchlists to receive alerts to take action as risks appear. Once a risk is identified, AWS Supply Chain will automatically provide recommended actions to take, such as moving inventory between locations, based on the percentage of risk resolved, the distance between facilities, and the sustainability impact. Teams can solve problems and collaborate using built-in chat and messaging functionality. With AWS Supply Chain, businesses can more accurately anticipate supply chain risks, take inventory rebalancing actions quickly to save costs, and meet customer expectations

Recommendations

Beyond the observations above, we recommend two themes for consideration under the inquiry:

Recommendation 1: A focus on strengthened mechanisms for industry-government cooperation

The New Zealand government has set a direction for the digital economy through recent publications such as the Digital Strategy for Aotearoa and the Digital ITP. These documents provide overarching direction for digital transformation in New Zealand and we are excited to see the future



implementation details and resourcing to make these a reality. As the government turns to the implementation of the Digital Strategy for Aotearoa and the Digital ITP, there is real scope to strengthen how industry and government can work together to achieve the identified goals. Close collaboration between industry and government will be required to ensure strong resilience of the sector, and the wider digital economy. Specific collaboration mechanisms should be identified to drive the level of public-private collaboration needed to drive execution of the nation's digital strategies and plans, and to support resilience of the sector. Government should consider establishing an ongoing dialogue mechanism to address how industry can align their own activities alongside funded government priorities. AWS can help identify additional ways in which industry can support government leadership on encouraging resilience, security, innovation and growth within the New Zealand digital economy, and this desire was reflected in a recent memorandum of understanding we signed with the New Zealand government.⁷

Recommendation 2: A focus on the importance of skilled people in the resilience value chain

Economic resilience frameworks across any sector should emphasize the availability of a sufficient number of well qualified people as critical enablers. This is important in the digital technology sector but also in any sector using digital technologies where a lack of skilled personnel is a constraint. In future, almost every business will need to be a digital-orientated business to thrive. Many of our New Zealand customers and partners are experiencing acute constraints to their growth prospects due to a lack of highly qualified technology workers, while also facing the prospects of losing talented New Zealanders overseas. Although perhaps most acute in the technology sector, the skills deficit is being felt in all businesses looking for technology talent for their digital transformation.

We would welcome the Commission highlighting the importance of digital skilling across all industries in the future, including traditionally non-digital ones and including small businesses. Closer collaboration is needed between industry, government and education providers. AWS, for example, is committed to being a significant contributor to the skilling of New Zealanders in the coming years and is actively looking for opportunities to reach underrepresented communities with its training offerings. To foster more talent, AWS intends to provide cloud training opportunities for up to 100,000 people in New Zealand over five years through a range of programs such as [AWS Skill Builder](#), which provides over 600 free on-demand cloud courses online. AWS is also supporting greater diversity in the technology sector by training underrepresented communities such as woman, Māori, and Pasifika through free programmes such as [AWS Hāpori Wahine](#), a 4-week initiative for women to build cloud skills, and [AWS re/Start](#), a 12-week program run by Te Pūkenga, to prepare individuals for cloud jobs.

We would welcome an industry-government dialogue on concrete measures for addressing the well identified digital skills deficit in New Zealand.⁸ We believe there is the opportunity for more concerted public-private collaboration that better aligns industry requirements and industry training and certification programmes with the national qualifications framework so that young New Zealanders can emerge from secondary and tertiary education having earned both national qualifications and industry-relevant skills and certifications. For example, we are committed to exploring how cloud certifications can be recognised as part of the National Certificate of Educational Achievement (NCEA) and Skills Framework for the Information Age (SFIA).

⁷ <https://www.aboutamazon.com.au/news/aws/new-zealand-government-and-amazon-web-services-collaborate-to-advance-digital-transformation-and-economic-growth-in-aotearoa-new-zealand>

⁸ https://nztech.org.nz/wp-content/uploads/sites/8/2021/01/Digital-Skills-Aotearoa-Report-2021_online.pdf



Thank you again for the opportunity to comment on the Issues Paper. AWS would welcome an opportunity to engage with the Commission directly in the course of the inquiry, and we look forward to remaining engaged in subsequent stages of the public consultation. Please do not hesitate to contact me at pdkeatin@amazon.com should you wish to follow up on our comments.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Paul Keating", enclosed in a light grey rectangular box.

Paul Keating
Head of Public Policy, New Zealand
Amazon Web Services